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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,302	09/22/2005	Michihiro Ohnishi	09947.0002-00000	1171

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EXAMINER
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FORMAN, BETTY J

ART UNIT	PAPER NUMBER
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1634

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12/14/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/550,302	OHNISHI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	BJ Forman	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 06 November 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,3,4 and 7-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4 and 7-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/09</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6 November 2009 has been entered.

### ***Status of the Claims***

2. This action is in response to papers filed 6 November 2009 in which claims 1 and 7 were amended and claim 6 was canceled. The amendments have been thoroughly reviewed and entered.

The previous rejections in the Office Action dated 15 July 2009 withdrawn in view of the amendments and new grounds for rejection. Applicant's arguments have been thoroughly reviewed but are deemed moot in view of the amendments, withdrawn rejections and new grounds for rejection. New grounds for rejection are discussed.

Claims 1, 3-4 and 7-13 are under prosecution.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3-4 and 7-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Quake et al (WO 02/40874, published 23 May 2002).

Regarding Claim 1, Quake teaches a first substrate (1122) and a second substrate (1130) connected to the first substrate defining connecting surface wherein the first and second substrates are grooved forming a channel (1126) and wherein the grooves have projections (1124 & 1128) wherein the gap is variable by moving the projections and wherein the gap is configured to block beads of a size greater than the gap (¶ 21, ¶ 208 and Fig. 11C).

Regarding Claim 3, Quake teaches the device wherein the first protrusion is opposed to the second protrusion (¶ 208, lines 24-30).

Regarding Claim 4, Quake teaches the device wherein the gap is formed by inserting the protrusion of the first substrate into those of the second (i.e. interlocked, ¶ 208).

Regarding Claim 7, Quake teaches the device wherein an inner wall of the channel is surface treated (¶ 234).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quake et al (WO 02/40874, published 23 May 2002) in view of Lough et al (U.S. Patent No. 5,900,481, issued 4 May 1999) or Smith et al (U.S. Patent No. 6,270,970, issued 7 August 2001).

Regarding Claims 8-12, Quake teaches a first substrate (1122) and a second substrate (1130) connected to the first substrate defining connecting surface wherein the first and second substrates are grooved forming a channel (1126) and wherein the grooves have projections (1124 & 1128) wherein the gap is variable by moving the projections and wherein the gap is configured to block beads of a size greater than the gap (¶ 21, ¶ 208 and Fig. 11C) but Quake is silent regarding the size, structure or composition of the beads.

However, silica particles of less than 10µm having hydroxyl functional groups were well known and routinely practiced in the art at the time the claimed invention was made as taught by Lough et al.

Lough et al teach silica microbeads having a preferred size of less than 10µm (Column 3, lines 13-15, 25-26) and hydroxyl functional groups (Fig.2) wherein the surface is treated with a silane coupling agent (Fig. 2, Columns 3-4) whereby the

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nucleic acids for detecting are absorbed onto the surface of the beads (Abstract).

Lough et al further teach the functionalization of the beads and surfaces provides differential immobilization chemistry between the bead-surface-nucleic acids (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the bead and surface functionality of Lough et al to the particles of Quake. One of ordinary skill in the art would have been motivated to do so based on the preferred differential immobilization of Lough (Abstract).

Furthermore, Smith teaches silica microbeads having a preferred size of less than 10 $\mu$ m (Column 12, lines 16-32) and immobilization-specific functional groups (Column 14, lines 45-56) wherein the surface is treated with a silane coupling agent (Column 14, line 57-Column 15, line 12) whereby the nucleic acids for detecting are selectively absorbed onto and released from the surface of the beads based on the presence and/or concentration of chaotropic salts (Column 16, line 58-Column 17, line 25) whereby the salts provide the nucleic acids in an unfolded state (Column 10, lines 43-57).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the chaotropic salts of Smith et al to the hybridization methods of Quake. One of ordinary skill in the art would have been motivated to do so for the expected benefit of providing unfolded nucleic acids that are more thermodynamically stable than folded nucleic acids to thereby favor hybrid formation (Smith et al, Column 10, lines 43-57).

7. Claims 1, 3-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zenhausern et al (U.S. Patent Application Publication No. 2004/0011650, filed 22 July 2002 in view of Quake et al (WO 02/40874, published 23 May 2002).

Regarding Claim 1, Zenhausern teaches a microchip having a microchannel formed in a substrate using known techniques (§ 48), wherein the microchannel is provided with a gap wherein adjacent sides of the channel (grooved parts) have protruding parts (constrictions) forming the gap wherein the first or second protruding part is movable (i.e. “movable array of constrictions within the channel” § 61 and Fig. 2).

Zenhausern specifically teaches that the channeled structure “may be fabricated in a variety of ways” (§ 48) but does not specifically teach a channel formed between two grooved substrates. Zenhausern further teaches the channels are constricted but does not teach a size of the particle relative to the constriction (§ 47, 252).

However, channel formation between opposing grooved substrates having protrusions movable to block beads of a predetermined size was well known in the art at the time the invention was made as taught by Quake (§ 21 and 208). Quake further teaches that the protruding valves facilitate retention and analysis of analytes on the particles (§ 314).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the grooved substrates forming protruding valves of Quake to the device of Zenhausern. One of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success based on the suggestion of Zenhausern to use any of a variety of known techniques to construct the channels.

One of ordinary skill would have been further motivated to do so for the benefit of facilitating retention and analysis of analytes on the particles as taught by Quake (¶ 314).

Regarding Claim 3, Zenhausern et al disclose the microchip wherein the gap is formed by opposed protruding parts (Fig. 2, ¶ 252).

Regarding Claim 4, Zenhausern et al disclose the microchip wherein the channel has protruding parts within the channels (Fig. 1 and 2) wherein the constriction inserts the protruding parts of the channels into the grooved channel of the opposing substrate, which are formed by bonding upper and lower substrate (¶ 48 and ¶ 60). Hence, the protrusion formed in one substrate is within the channel structure of the other substrate.

Regarding Claim 7, Zenhausern et al disclose the microchip wherein the inner surface of the microchannel is treated with biocompatible materials to prevent non-specific binding (¶ 49-50).

8. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zenhausern et al (U.S. Patent Application Publication No. 2004/0011650, filed 22 July 2002) in view of in view of Quake et al (WO 02/40874, published 23 May 2002) as applied to Claim 1 above and further in view of Lough et al (U.S. Patent No. 5,900,481, issued 4 May 1999) or Smith et al (U.S. Patent No. 6,270,970, issued 7 August 2001).

Regarding Claims 8-12, Zenhausern et al disclose a microchip having a microchannel formed in a substrate using known techniques (¶ 48), wherein the



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microchannel is provided with a gap having a sectional size variable by a movable protruding part i.e. movable array of constrictions (§ 61, 252) and Nikiforov et al teach channel formation between opposing grooved substrates (Column 8, lines 15-61).

Zenhausern et al further teach the channels are constricted to capture nucleic acid-immobilized on beads for analysis wherein the channel diameter is less than 10µm (§ 47, 252) but they do not specifically teach the bead diameter or hydroxyl functional groups for nucleic acid attachment. However, silica particles of less than 10µm having hydroxyl functional groups were well known and routinely practiced in the art at the time the claimed invention was made as taught by Lough et al.

Lough et al teach silica microbeads having a preferred size of less than 10µm (Column 3, lines 13-15, 25-26) and hydroxyl functional groups (Fig.2) wherein the surface is treated with a silane coupling agent (Fig. 2, Columns 3-4) whereby the nucleic acids for detecting are absorbed onto the surface of the beads (Abstract). Lough et al further teach the functionalization of the beads and surfaces provides differential immobilization chemistry between the bead-surface-nucleic acids (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the bead and surface functionality of Lough et al to the particles of Zenhausern. One of ordinary skill in the art would have been motivated to do so based on the preferred differential immobilization of Lough (Abstract).

Smith also teach silica microbeads having a preferred size of less than 10µm (Column 12, lines 16-32) and immobilization-specific functional groups (Column 14,

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lines 45-56) wherein the surface is treated with a silane coupling agent (Column 14, line 57-Column 15, line 12) whereby the nucleic acids for detecting are selectively absorbed onto and released from the surface of the beads based on the presence and/or concentration of chaotropic salts (Column 16, line 58-Column 17, line 25) whereby the salts provide the nucleic acids in an unfolded state (Column 10, lines 43-57).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the chaotropic salts of Smith et al to the hybridization methods of Zenhausern and Lough. One of ordinary skill in the art would have been motivated to do so for the expected benefit of providing unfolded nucleic acids that are more thermodynamically stable than folded nucleic acids to thereby favor hybrid formation (Smith et al, Column 10, lines 43-57).

### ***Conclusion***

9. No claim is allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BJ Forman whose telephone number is (571) 272-0741. The examiner can normally be reached on 6:00 TO 3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Nguyen can be reached on (571) 272-0731. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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